

Process Approach to Determining Quality Inspection Deployment Product Overview

May 7, 2015

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Process Approach to Determining Quality Inspection Deployment

Product Overview

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May 7, 2015

U.S. SPACE PROGRAM MISSION ASSURANCE IMPROVEMENT WORKSHOP
LOCKHEED-MARTIN | SUNNYVALE, CA | MAY 5 - 7, 2015

Agenda

- Motivation and Team Charter
- Product Overview
- Examples
- Topic Details
- Topic Follow-on Recommendations
- Team Membership and Recognition



Motivation for Topic

- DOD issued 55 years ago MIL-Q-9858A and MIL-I-45208A
 - *Emphasis on complete and frequent visual inspection*
- Technology has improved since then
 - *Process controls*
 - *Product quality*
 - *Inspection capabilities*
- Inspection change versus risk guidance is lacking

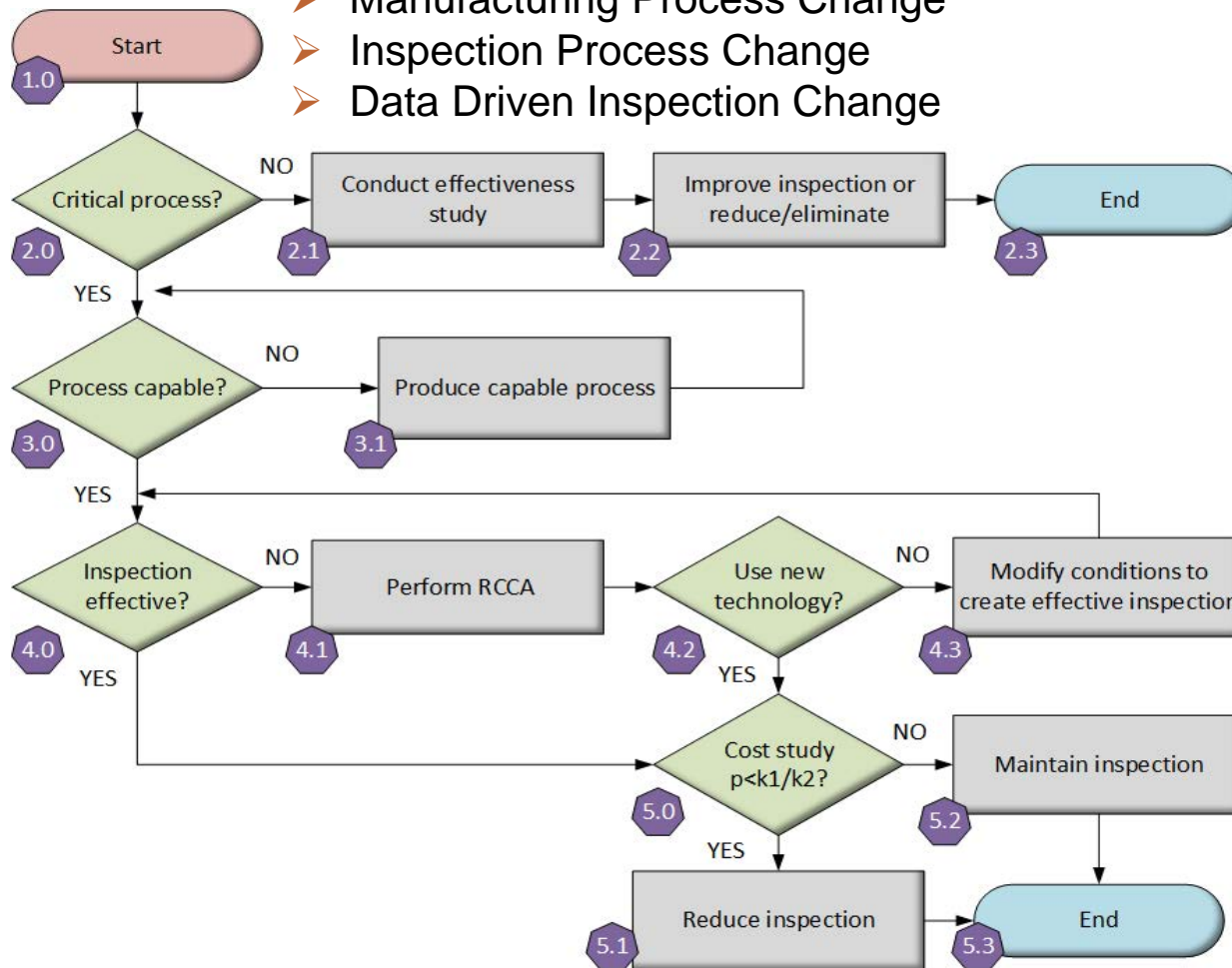
Team Charter

- Develop a tool for determining if a change in inspection approach is warranted
 - *Review industry data and feedback from DCMA to identify candidate processes*
 - *Identify best practices for optimal quality inspection planning and deployment*
 - *Evaluate candidate processes using new tool*



Decision Tree

- Manufacturing Process Change
- Inspection Process Change
- Data Driven Inspection Change

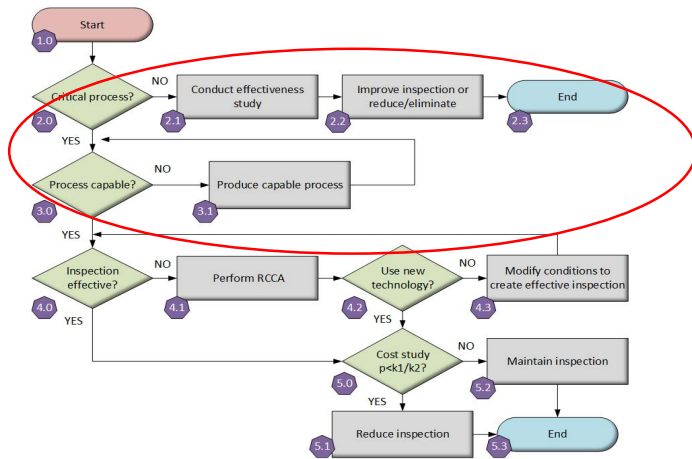


Example

ICT via Flying Probe

- Shift inspection of PWB from manual inspection to flying head automated probe
 - *False errors manual inspection reduced*
 - *Time study of the same board shows significant time reduction*
 - *Output of machine lists part non-conformities*
 - *Manual Inspection covers 10-20% of parts not covered by the machine*

In-Circuit Test via Flying Head Probe Analyses Performed



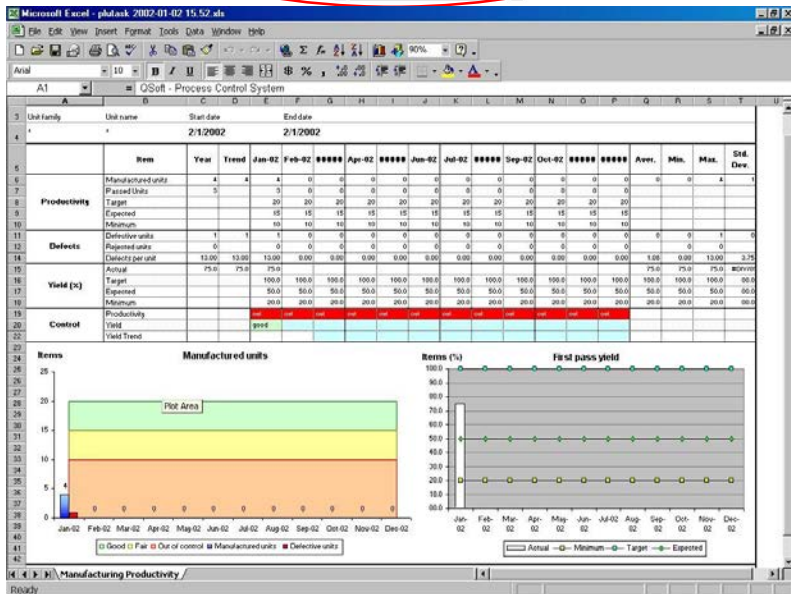
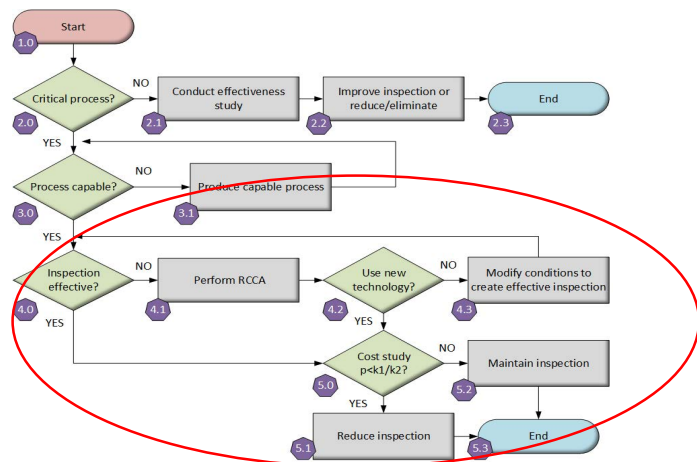
Critical Process

- Reviewed historical inspection process output
- Reviewed customer requirements
- Identified potential tool suppliers
- Performed risk analysis against existing processes
- Study of cost vs. CAPEX vs. inspection performance completed

Process Capability

- Reviewed supplier tool sets
- Performed bench test using EDU boards
- Verified results against existing inspection method
- Identified process accuracy and repeatability issues
- Compared results to risk and cost analyses

In-Circuit Test via Flying Head Probe Analyses Performed



Effective Inspection

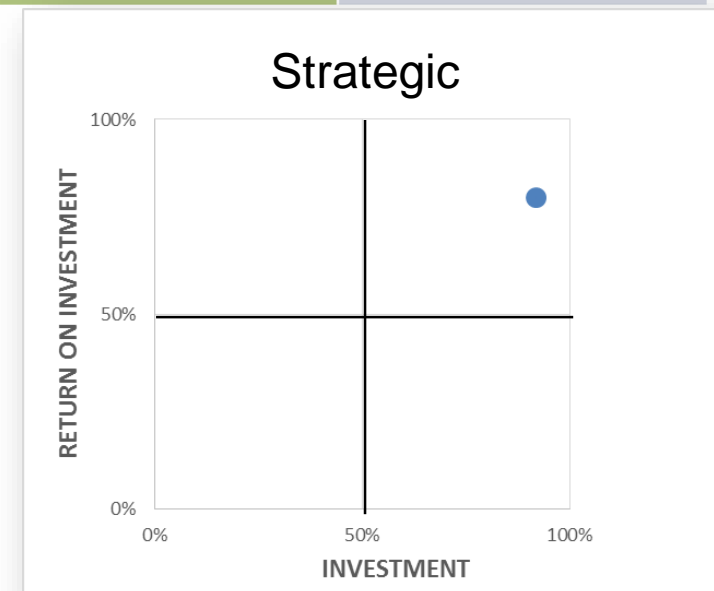
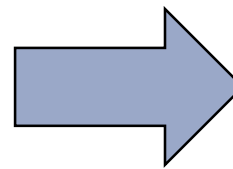
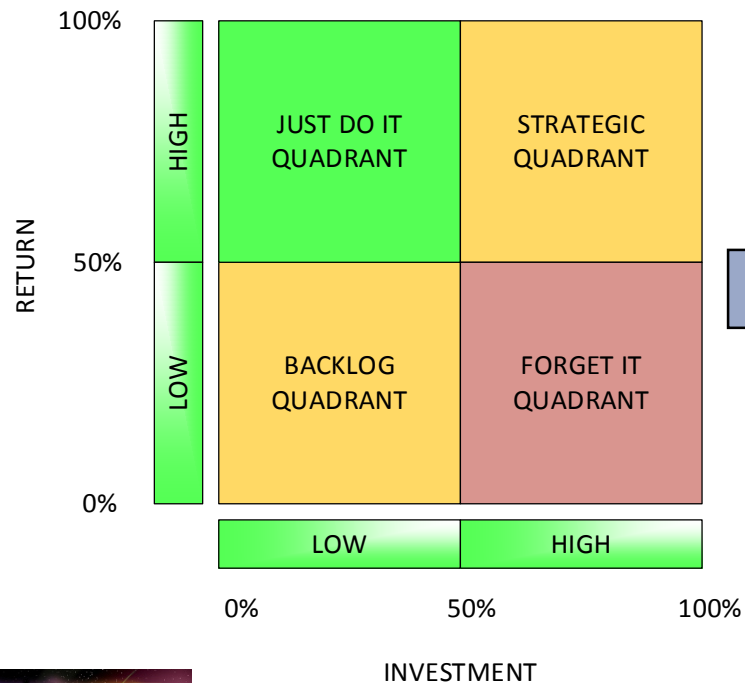
- Test board coverage and issues reviewed
- Identified requirements against typical part usage
- Identified part types and applications where ICT not able to capture all issues

ROI

- Performed study for purchasing unit vs. outsourcing
- Identified multiple suppliers and reviewed capabilities against requirements


Analysis Results into Tool

Analysis Category	Entries in tool	Manufacturing Process Change	Inspection Process Change	Data Driven Insp. Change
Manufacturing	Lines 1-5	40%	22%	22%
Inspection	Lines 6-8	30%	45%	38%
Cost and Customer	Lines 9-10	30%	33%	40%



Tool Design

<u>Analyses</u>	<u>Justification</u>	<u>Weight</u>	<u>Return</u>	<u>Investment</u>
<u>Fixed by Tool</u>		<u>User Modifiable</u>	<u>User Modifiable</u>	<u>User Modifiable</u>
<div>1. Do the results of a PFMEA show potential for improved quality?</div> <div>2. Is the process qualified and capable?</div> <div>3. Does the first article indicate less inspection is required?</div> <div>4. Does the current process have a low level of nonconformities?</div> <div>5. Does the proposed process output rate affect inspection capabilities?</div> <div>6. Was a gage R&R performed with personnel performing the inspection function?</div> <div>7. Will the improved inspector process increase the ability to find nonconformities?</div> <div>8. Will the process change reduce inspector escapes?</div> <div>9. Has a cost analysis been performed (p<k1/k2, see Appendix B)?</div> <div>10. Will the customer allow the change?</div>		<div><ul style="list-style-type: none">• Manufacturing Process Change• Inspection Process Change• Management or Customer Input</div>	<div>1. Does not justify removal of inspection process</div> <div>2. Additional data required before decision can be made</div> <div>3. Data Justifies capabilities study for process modification</div> <div>4. Justifies modification of inspection process</div> <div>5. Justifies removal of inspection process</div>	<div>1. Low Effort (Easy or completed, limited personnel, <3 months)</div> <div>2. Between Low and Medium</div> <div>3. Medium Effort (Hurdles, somewhat difficult, >6 months)</div> <div>4. Between Medium and High</div> <div>5. High Effort (Complex, lots of people, >1 yr)</div>
			Weighted results	

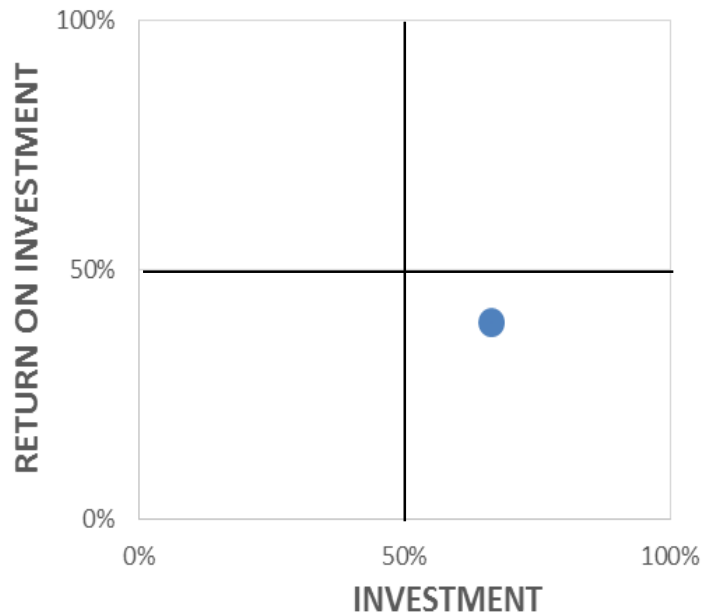




Additional Examples in Product

Torque Witness by Inspection Personnel

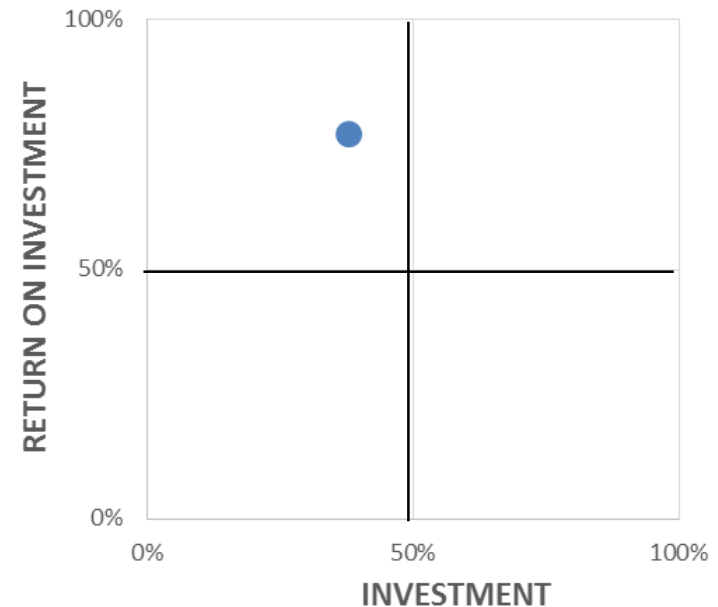
Forget It



*Evaluating whether or not to eliminate
Inspection witness of "Torque" operations*

Test to flight (class 2) electrical mates

Just Do It



*Elimination of a secondary inspection
(by QA) for test to flight connector mates*

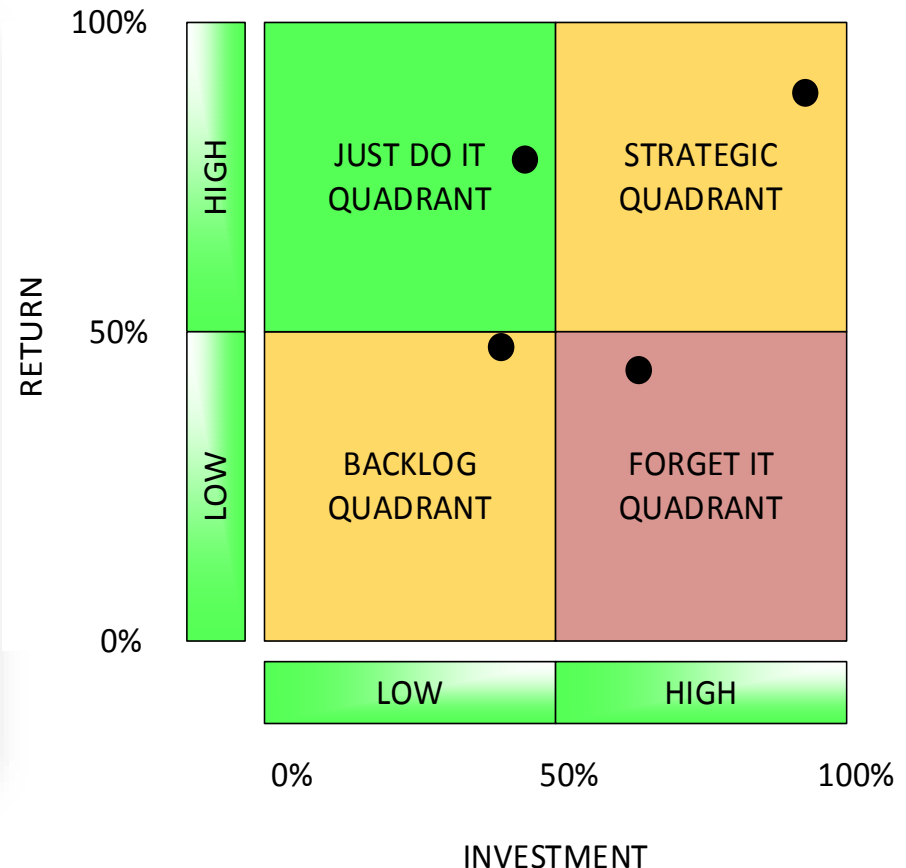
Additional Examples in Product

Receiving Inspection of subcontracted products (QSI-1002)



Evaluating reduction in duplicative inspection efforts upon receipt for items that are Final Source Inspected

Examples of Each Potential Outcome



Target Audience and Intended Product Use

- Target Audience
 - *Quality organizations looking for efficiencies*
 - *Manufacturing organizations pursuing new technology*
 - *Stakeholders seeking ways to reduce non-value added costs*
- How Used
 - *Best applied early in change evaluation decision*
 - *Useful when many trades are possible*
 - Provides best indication of tradeoffs resulting from a proposed process change



Quality Deployment Team Membership

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Frank	Pastizzo	SSL
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